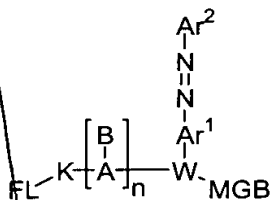


WHAT IS CLAIMED IS:

1. An oligonucleotide probe having the formula:



wherein

Ar^1 and Ar^2 are each independently a substituted or unsubstituted aryl group;

MGB is a minor groove binding group;

FL is a fluorescent group having an emission maxima in the region from about 400 to about 900 nm;

K is a cyclic or acyclic linking group having from 1 to 30 backbone atoms selected from C, N, O, S and P;

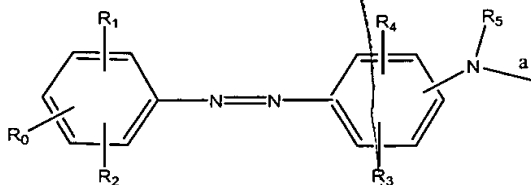
W is a linking group having from 3 to 100 backbone atoms selected from C, N, O, S and P, said linking group being cyclic, acyclic or a combination thereof;

$[\text{A}-\text{B}]_n$ is a natural or modified oligonucleotide having from 4 to 100 bases; and the subscript n is an integer of from 4 to 100.

2. An oligonucleotide probe of claim 1, wherein Ar^1 is a substituted or unsubstituted aryl group selected from the group consisting of phenyl, naphthyl, 2-benzothiazolyl, 3-benzoisothiazolyl and 2-thiazolyl.

3. An oligonucleotide probe of claim 2, wherein Ar^2 bears from one to three substituents selected from the group consisting of nitro, cyano, halo, $-\text{C}(\text{O})\text{R}^1$, $-\text{C}(\text{O})\text{NR}^1\text{R}^2$, $-\text{SO}_2\text{R}^1$, $-\text{SO}_2\text{F}$ and $-\text{SO}_2\text{NR}^1\text{R}^2$, wherein each R^1 and R^2 is independently selected from the group consisting of H, $(\text{C}_1-\text{C}_6)\text{alkyl}$ and hydroxy $(\text{C}_1-\text{C}_6)\text{alkyl}$.

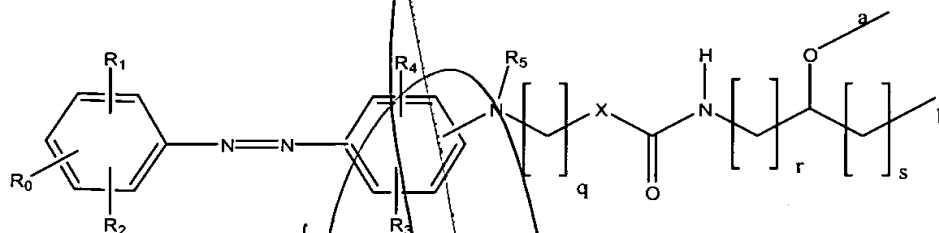
4. An oligonucleotide probe of claim 1, wherein the group $-\text{Ar}^1-\text{N}=\text{N}-\text{Ar}^2$ is a quencher moiety having the formula:



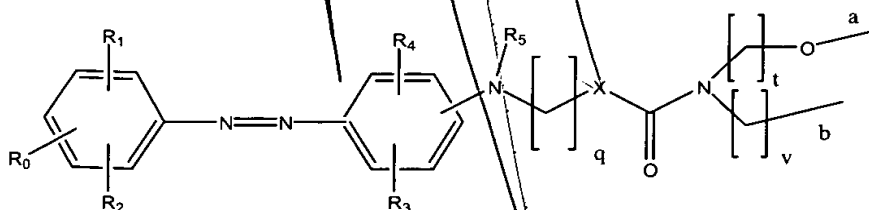
wherein

R_0, R_1, R_2, R_3 and R_4 are independently selected from the group consisting of H,
 halogen, NO_2 , SO_3R , $\text{SO}_2\text{N}(\text{R})_2$, $\text{C}(\text{O})\text{OR}$, $\text{C}(\text{O})\text{N}(\text{R})_2$, CN, CNS, OR,
 $\text{OC}(\text{O})\text{R}$, SR, CF_3 , $\text{NHC}(\text{O})\text{R}$, $\text{N}(\text{R})_2$ and $\text{N}[\text{R}]_3$ wherein each R is
 independently selected from the group consisting of H, $(\text{C}_1\text{-C}_8)\text{alkyl}$, aryl (and
 heteroaryl), or a blocking group compatible with oligonucleotide synthesis;
 and R_5 is -H or $(\text{C}_1\text{-C}_8)\text{alkyl}$, and the quencher moiety is attached to the linker
 through the valence bond designated a.

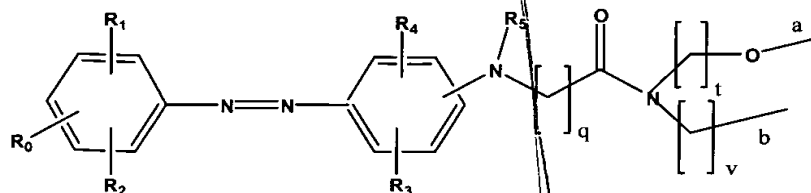
5. A compound of claim 1, wherein the group $\text{W-Ar}^1\text{-N=N-Ar}^2$ is a
 quencher moiety-linking group combination having a formula selected from the group
 consisting of Q-1, Q-2 and Q-3:



Q-1



Q-2



Q-3

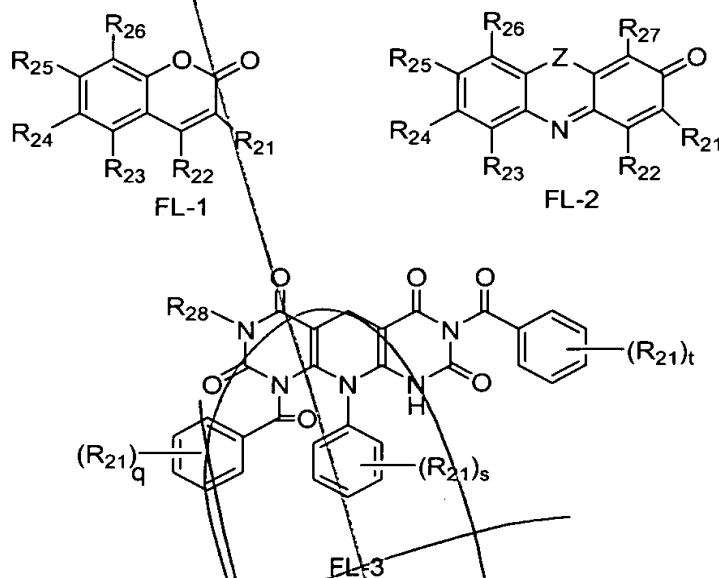
wherein

q, r, s, t and v are each independently an integer of from 1 to 20;

7 X is -O-, -OCH₂- or -CH₂-; and

8 the conjugated quencher and linker moiety is attached to the [A-B]_n portion through
9 one of the valence bonds designated a or b; and is attached to the minor
10 groove binder portion through the other of valence bonds designated a or b.

1 6. An oligonucleotide probe of claim 1, wherein Fl is a fluorophore
2 selected from the group consisting of FL-1, FL-2 and FL-3:



3
4 wherein

5 R₂₁, R₂₂, R₂₃, R₂₄, R₂₅, R₂₆ and R₂₇ are each substituents independently selected from
6 the group consisting of H, halogen, NO₂, SO₃R, SO₂N(R)₂, C(O)OR,
7 C(O)N(R)₂, CN, CNS, OR, OC(O)R, SR, CF₃, NHC(O)R, N(R)₂ and N[R]₃
8 wherein each R is independently selected from the group consisting of H, (C₁-
9 C₈)alkyl, aryl (and heteroaryl), or a blocking group compatible with
10 oligonucleotide synthesis, and optionally two adjacent groups from R₂₁
11 through R₂₆ are combined to form a five- or six-membered ring having from
12 zero to three heteroatoms as ring member, with the proviso that at least one of
13 R₂₁ through R₂₇ is a bond that attaches said fluorophore to said linking group
14 K; and

15 R₂₈ is a member selected from the group consisting of H and (C₁-C₈)alkyl.

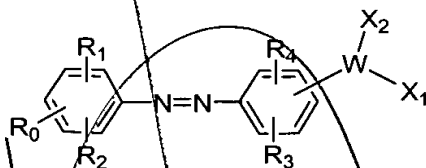
1 7. An oligonucleotide probe of claim 1, wherein Fl is a fluorophore of
2 formula FL-1.

1 8. An oligonucleotide probe of claim 1, wherein F1 is a fluorophore of
2 formula FL-2.

1 9. An oligonucleotide probe of claim 1, wherein F1 is a fluorophore of
2 formula FL-3.

1 10. An oligonucleotide probe of claim 1, wherein MGB is a minor groove
2 binder selected from the group consisting of analogs of CC1065, Hoeschst 33258, DAPI,
3 lexitropsins, distamycin, netropsin, berenil (and related diarylamidines), duocarmycin,
4 pentamidine, 4,6-diamino-2-phenylindole, and pyrrolo[2,1-c][1,4]benzodiazepines.

1 11. A quencher-phosphoramidite reagent having the formula:



wherein

W is a linking group;

X₁ is selected from the group consisting of H, (C₁-C₁₂)alkyl, aryl, heteroaryl and a
protected or unprotected functional group;

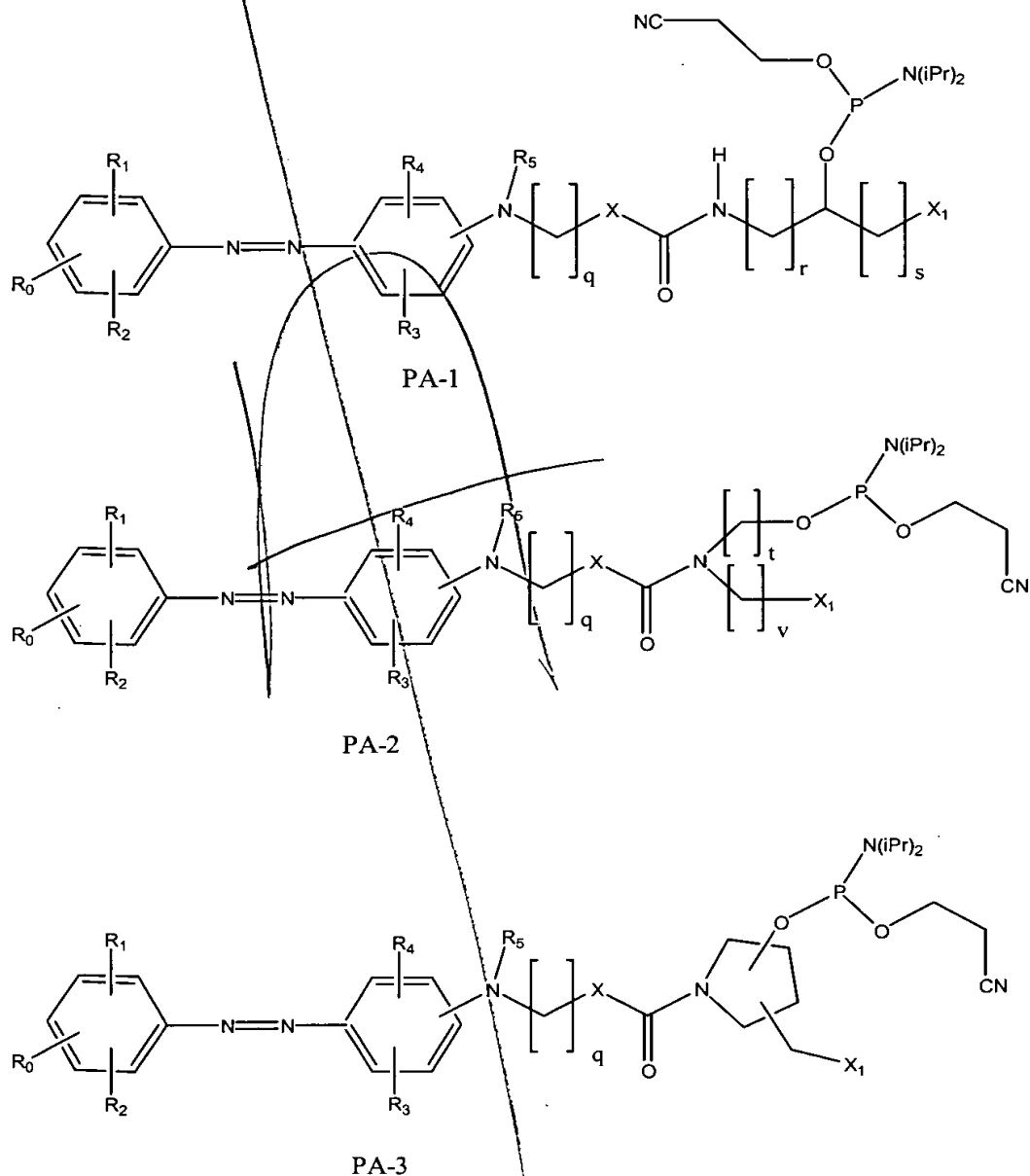
X₂ is a phosphorus coupling moiety; and

R₀, R₁, R₂, R₃ and R₄ are independently selected from the group consisting of H,
halogen, NO₂, SO₃R, SO₂N(R)₂, C(O)OR, C(O)N(R)₂, CN, CNS, OR,
OC(O)R, SR, CF₃, NHC(O)R, N(R)₂ or N[R]₃ wherein each R is
independently H, (C₁-C₈)alkyl, aryl (and heteroaryl), or a blocking group
compatible with oligonucleotide synthesis; and optionally, two of R₀, R₁ and
R₂ are combined to form a five- or six-membered ring having from one to
three heteroatoms as ring members; and optionally R₃ and R₄ are combined to
form a five- or six-membered ring having from one to three heteroatoms as
ring members.

1 12. A quencher-phosphoramidite reagent of claim 11, wherein R₀, R₁ and
2 R₂ are independently selected from the group consisting of H, halogen, NO₂, SO₃R,
3 SO₂N(R)₂, C(O)OR, C(O)N(R)₂, CN, CNS and CF₃, wherein each R is independently H, (C₁-
4 C₈)alkyl or aryl; and R₃ and R₄ are independently selected from the group consisting of H,

OR, OC(O)R, SR, NHC(O)R, N(R)₂ or N[R]₃ wherein each R is independently H, (C₁-C₈)alkyl or aryl.

13. A quencher-phosphoramidite reagent of claim 11, having the formula selected from the group consisting of the formulas designated PA-1, PA-2 and PA-3.



wherein

R₀, R₁, R₂, R₃ and R₄ are each independently selected from the group consisting of -H, halogen, NO₂, SO₃R, SO₂N(R)₂, C(O)OR, C(O)N(R)₂, CN, CNS, OR, OC(O)R, SR, CF₃, NHC(O)R, N(R)₂ or N[R]₃ wherein each R is independently H, (C₁-C₈)alkyl, aryl (and heteroaryl), or a blocking group

compatible with oligonucleotide synthesis; and optionally, two of R_0 , R_1 and R_2 are combined to form a five- or six-membered ring having from zero to three heteroatoms as ring members; and optionally R_3 and R_4 are combined to form a five- or six-membered ring having from zero to three heteroatoms as ring members;

R_5 is selected from the group consisting of -H or $-(C_1-C_8)\text{alkyl}$;

the subscripts q , r , s , t and v are each independently an integer of from 1 to 20;

X is $-O-$ or $-CH_2-$; and

X_1 is selected from the group consisting of OH, O-dimethoxytrityl, O-methoxytrityl, O-trityl or an oxygen atom having an acid labile blocking group.

14. A quencher-phosphoramidite reagent of claim 13, having the formula

PA-1.

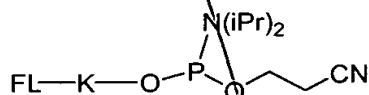
15. A quencher-phosphoramidite reagent of claim 13, having the formula

PA-2.

16. A quencher-phosphoramidite reagent of claim 13, having the formula

PA-3.

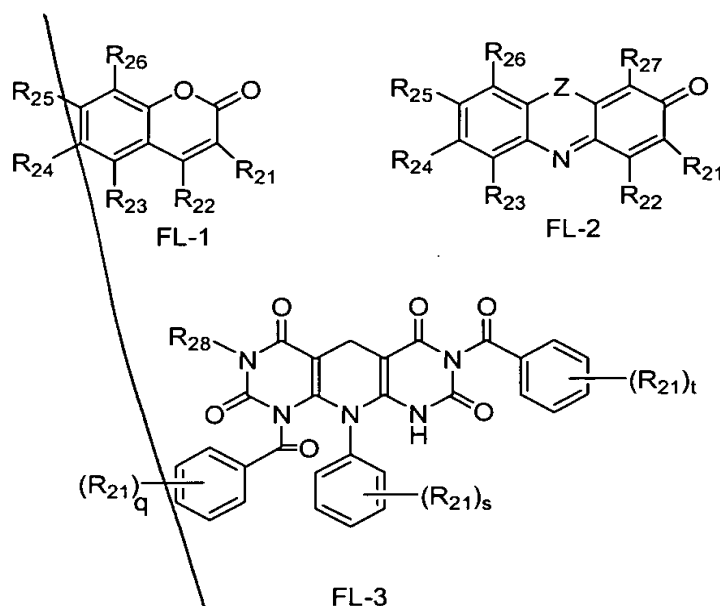
17. A fluorophore-phosphoramidite reagent having the formula:



wherein

K is a bifunctional linking group; and

FL is a fluorophore selected from the group consisting of:



wherein

R_{21} , R_{22} , R_{23} , R_{24} , R_{25} , R_{26} and R_{27} are each substituents independently selected from the group consisting of H, halogen, NO_2 , SO_3R , $\text{SO}_2\text{N}(\text{R})_2$, $\text{C}(\text{O})\text{OR}$, $\text{C}(\text{O})\text{N}(\text{R})_2$, CN , CNS , OR , $\text{OC}(\text{O})\text{R}$, SR , CF_3 , $\text{NHC}(\text{O})\text{R}$, $\text{N}(\text{R})_2$ and $\text{N}[\text{R}]_3$ wherein each R is independently selected from the group consisting of H, $(\text{C}_1\text{-C}_8)\text{alkyl}$, aryl (and heteroaryl), or a blocking group compatible with oligonucleotide synthesis, and optionally two adjacent groups from R_{21} through R_{26} are combined to form a five- or six-membered ring having from zero to three heteroatoms as ring member, with the proviso that at least one of R_{21} through R_{27} is a bond that attaches said fluorophore to said linking group K;

the subscripts q, s and t are integers of from 0 to 5; and

R_{28} is a member selected from the group consisting of H and $(\text{C}_1\text{-C}_8)\text{alkyl}$.

18. A fluorophore-phosphoramidite reagent of claim 17, wherein Fl is a fluorophore of formula FL-1.

19. A fluorophore-phosphoramidite reagent of claim 17, wherein Fl is a fluorophore of formula FL-2.

20. A fluorophore-phosphoramidite reagent of claim 17, wherein Fl is a fluorophore of formula FL-3.

21. A method for hybridizing nucleic acids comprising:

- 2 a) incubating a first oligonucleotide with an oligonucleotide probe; and
3 b) identifying a hybridized nucleic acid;
4 wherein said oligonucleotide probe is a probe according to claim 1.

1 22. A method in accordance with claim 21, wherein said oligonucleotide
2 probe comprises a fluorophore selected from the group consisting of FL-1, FL-2 and FL-3.

1 23. A method in accordance with claim 21, further comprising the step of
2 altering the spatial relationship between the fluorophore and quencher portions of said
3 oligonucleotide probe.

1 24. A method in accordance with claim 23, wherein said altering is a result
2 of hybridization.

1 25. A method in accordance with claim 21, wherein said method further
2 comprises releasing the fluorophore from the oligonucleotide probe subsequent to
3 hybridization.

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